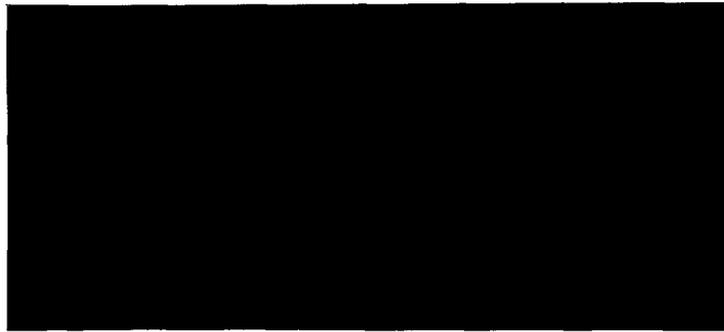


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PROJET
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TADLA RESOURCES
MANAGEMENT



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A

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TADLA RESOURCES MANAGEMENT PROJECT
(USAID Contract No. 605-0211-C-4002)

Third Annual Report
(January 1 to December 31, 1996)

Report No. 50

January 1997

B

PREFACE

This is the third annual report (serving also as the twelfth quarterly report) of the Tadla Resources Management Project (TRM). The report is in partial fulfillment of Chemonics' contract No. 608-0213-C-4002 with USAID. The TRM Project team herein evaluates progress in achieving revised 1996 work plan performance indicators and targets as approved by USAID in April 1996. It also provides a basis for evaluation of Project progress against anticipated results as set forth in the above contract and formally modified in June of 1995.

The project tracked all planned activities as outlined in the 1996 work plan in terms of achievement and level of effort. Annex A provides objective trees for activities by performance indicator. Annex B summarizes by component the percent achievement for each activity. Table 2 (in section A5) summarizes total, expended, and unused level of effort by major categories to date. Annex C presents a list of technical assistance activities to date, while Annex D presents a list of in-country training courses held during the year.

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SECTION I OVERVIEW OF THE PROJECT

A. Background.

The Tadla Resources Management (TRM) Project is a USAID funded 4 5 year, \$10 6 million dollar project, with 4 long-term expatriate technical assistants and 124 person months of short term technical assistance to be expended from December 1993 to PACD, September 1998. The project goal is to promote the long-term competitiveness and environmental sustainability of Moroccan irrigated agriculture. The project purpose is to increase the efficiency, economic yield and environmental sustainability of irrigation resources management and use in the Tadla irrigation perimeter.

The project contract divides activities into five components:

- **Component 1 Improved irrigation system management.** Greater efficiency, flexibility, reliability and timeliness of irrigation system water delivery to Tadla irrigation perimeter farmers, using a comprehensive irrigation system management model.
- **Component 2 Improved on-farm water management.** Enhanced farm-level management of perimeter resources and farmer participation in the management of the irrigation system, through the adoption of demonstrated and disseminated water saving and productive technologies.
- **Component 3. Sustainable environmental management.** Long-term preservation of the Tadla perimeter system and environment by addressing issues such as waterlogging, and water and soil quality degradation, through improved ground water and drainage management, soil and water quality management, improved agro-chemical management and use, and agro-industrial pollution prevention.
- **Component 4 Private sector strengthening.** Reinforcement of private sector participation in the Tadla economy through strengthening farmer organizations and linkages with agricultural suppliers and buyers and through a program to enhance the role of women in the pursuit of agricultural as well as other business enterprises in the Tadla perimeter.
- **Component 5. Improved Moroccan irrigation resources management policy.** Support for institutional, procedural and policy development of ORMVAT and the large-scale irrigation sector through appropriate analyses and dialogue enhanced by regional workshops which disseminate information to a national ORMVA/GOM constituency.

B Expected Results under a Re-engineered Orientation of the Project.

In December, 1995, USAID/Morocco initiated re-engineering of their mission program. As a partner in this process, the Project agreed to subsume the above five components under five measurable performance indicators to support Environment and Natural Resources (ENR) Strategic Objective No. 2, "Improved water resources management in the agriculture, urban and industrial sectors". With this "managing for measurable results" orientation, the Project now focuses activities and resources on achieving the following:

- 1 increased volume of water saved through improved canal conveyance efficiency and through improved on-farm water management.
- 2 reduced pollution for a more sustainable environment through reduced amount of nitrate potentially leached into the groundwater.
- 3 increased percentage of farmers adopting integrated pest management practices.
- 4 increased number of farmers in viable water users associations for the management and maintenance of the irrigation network.
- 5 diffusion of technologies to other irrigated perimeters.
- 6 progress in national water policy and institutional reform.

The revised 1996 Annual Work Plan activities respond to these new orientations. Section III, with supporting tables and text, provides by performance indicator, an estimate of progress toward achieving specified impact targets compared to that planned.

SECTION II BRIEF REVIEW OF PROJECT ACTIVITIES

The following describes by performance indicator a brief synopsis of core work plan activities for 1996 and the significant contribution by the subcontractor partners. The 25 discrete activities represent a continuum of 3 years of Project effort to achieve its goals and objectives as depicted in the objective trees, Figures 1 through 5 Annex A. These objective trees, one for each performance indicator, reflect activities already accomplished and those anticipated over time in the context of the new performance evaluation framework.

A Current Activities

1 Increased volume of water savings

1a Improved canal conveyance efficiency

- **Develop a Comprehensive Geographic Information System (GIS)** conduct GIS applications training, digitalize pilot project area, prepare selected maps, prepare for digitalization of perimeter base maps through service of an outside vendor, incorporate basic data to support irrigation applications and the monitoring of the environment in the perimeter, purchase and install second workstation and LAN, train core GIS team in GIS UNIX systems administration
- **Develop a hydrologic analysis of water supply** test hydrologic model developed in 1995, modification of hydrologic model by expert to address needed changes identified, development of documentation, use model in irrigation planning
- **Develop an agro-meteorological network** install and calibrate 3 agromet stations, manual data collection, develop of prototype weather reports, initial training of ORMVAT staff in data collection
- **Install flow measurement devices** pursue PTT certification of imported radios and other telemetric equipment and obtaining PTT authorized radio frequency for canal flow measurement and agro-meteorological telemetric network
- **Develop a hydraulic simulation model** collect engineering blue prints other of physical characteristics of the canal system essential to the modeling effort, select software package, develop model
- **Develop an improved method for irrigation scheduling** develop a computer program for ORMVAT irrigation planning and scheduling
- **Develop a computer program for water ordering & delivery** develop computer program of water ordering and delivery forms used by ORMVAT

1b Improved On-Farm Water use efficiency

- **On-farm pilot demonstrations** extend level basin and other water saving technologies to new farm sites, collect and analyze data from level basin irrigation demonstrations contact private sector equipment suppliers for investment and operating cost estimates for land shaping and leveling equipment, initiate moves toward private sector supply of equipment, supplies and services for level basin technology
- **Conduct a second on-farm monitoring and evaluation survey** design survey, collect and analyze field data of 150 farms for second survey to monitor project progress and evaluate impact
- **Field days, demonstrations and farmer visits** organize and conduct farmer field days, organize instructional visits to level basin demonstrations provide technical information to interested farmers individually and in groups

2 Reduction in the amount of pollution in Tadla

- **Establish an integrated groundwater, soil and water quality monitoring network** Continue to collect data from the network, integrate data into the GIS, analyze the data, prepare and distribute related GIS analytical maps of nitrate pollution
- **Develop a nitrogen fertilizer application program** assess farmer fertilizer practices' contribution to groundwater nitrate contamination, develop an integrated plant nutrient (on-farm) demonstrations program that will contribute to reducing nitrogen leached into the Tadla groundwater
- **Establish computerized groundwater model** install U S Geological Survey's MODFLOW groundwater model and adapt it to the Tadla perimeter

3 Establish Integrated Pest Management (IPM) practices in Tadla

- **Develop IPM Pilot Program in Tadla** initiate the second phase of an IPM pilot effort for citrus and paprika (mora), two of the highest users of pesticides in the Tadla
- **Initiate IPM Working Group and Strengthen National Linkages** organize an IPM working group and establish linkages with the National IPM program

4 Increase Farmer Participation in Water Users Associations

- **Water Allocation Pilot Program** support the new pilot program for water allocation and planning through water users associations
- **Action Plan for WUA Strengthening** develop a plan of action for strengthening water users associations in Tadla

5. Dissemination of technology to other ORMVAs

- **Distribute BCWs** develop manual for use with Replogle broad crested weirs, construct and distribute sets of weirs to ORMVAT and other ORMVAs for measuring flows in secondary and tertiary irrigation canals
- **National Seminar on Project Progress** present progress update on improved irrigation management in the Tadla at National, Ministry of Agriculture sponsored seminar for all nine ORMVAs in Doukala (El Jadida)

6 National Policy Reform Matrix

- **Dialogue on Water Pricing Policy** a continuing process of exchange, use studies and action plans as vehicle for raising the debate on water pricing issues
- **Plan for WUA Empowerment.** technical assistance to prepare action plan for WUA development including outline of national policies and legislation to address
- **Invitational Water Policy and Irrigation Management Tour** sponsor an invitational tour in California and Arizona for the Director of ORMVAT and selected other leaders influencing national water policy and management of water resources
- **Enhance the Efficiency of Irrigation Authorities** technical assistance to link national policy of ORMVA re-engineering to TRM pilot activity with ORMVAT
- **Intersectoral Water Management Study.** provide technical assistance to assess the legal and institutional framework of the Moroccan water law of 1995 for the Ministry of Agriculture

7 USAID Washington Project Review organize and conduct field tour and TRM project review for Deputy Director Near East and Asia Bureau and USAID Morocco mission Director

8 Mid-term Evaluation participate in the Project's mid-term evaluation

9. Formal Training Courses plan and implement in collaboration with University of California, Davis

B Subcontractor Activities

Annex B provides a chronological listing of short term technical assistance activities conducted during 1996 to which Chemonics and its partners, RMI AGRIDEC, and NCBA contributed Table 2a Section IV provides in detail the subcontractor performance in providing level of effort for the overall project. Of the 27 person months of level of effort provided in 1996, RMI provided 16 pm (59.3%), AGRIDEC provided 6 pm (22.6%), NCBA provided (4.4%) and Chemonics 3.7 (13.7%) toward completing 15 separate core activities

In addition, the University of California, Davis fielded 11 instructors and 2 translators to conduct 8 formal training courses at ORMVAT for 86 engineers technicians extension agents and farmers, from the Tadla perimeter and from 6 other perimeters of Morocco This represents 4.6 person months of short term training for 1996 (See Annex D for details)

SECTION III PERFORMANCE

This section provides by performance indicator, an estimate of progress toward achieving specified impact targets, including supporting analysis of intermediate results which will lead to achieving the anticipated outcomes. It is important once again to emphasize that the activities initiated by the project during the last three years, will contribute to achieving the desired results, once all the new management systems are operational and being used by ORMVAT.

A Indicator # 1 Volume of water savings in the target areas

As indicated in Table 1.1, the targeted levels of water savings in the Tadla perimeter will be achieved by the combined improvement of canal conveyance efficiency and of improved efficiency of application of irrigation water on the farm. The contribution of management tools designed to improve performance of the irrigation system await completion of installation and training of ORMVAT staff. Project efforts are complimented by a PAGI II and ORMVAT funded canal maintenance and rehabilitation program.

A1 Improved canal conveyance efficiency

The following tools will enhance ORMVAT's capacity to improve the management of the canal system for improved canal conveyance efficiency. The Project depends on qualified and dedicated ORMVAT personnel for the development, installation, training and operation phases of these tools for them to successfully contribute to improved system management.

A1a. GIS development.

The GIS system is a computer system that manages the spatial data in digital form. Since most of the models and systems that the project is developing to improve the water resources management in Tadla are dependent on geographic locations, the GIS will serve an important planning and management tool through its capacity for integration of data, data analysis and presentation of results. The project is developing this tool through day to day ORMVAT personnel involvement. Two ORMVAT staff work full time with the GIS program and four others support it in the application design and data integration. Upon conclusion of the project, a fully operational GIS with highly trained personnel will be transferred to ORMVAT for subsequent operations, maintenance, and expansion.

The intermediate results to date include the following

- a fully operational GIS UNIX based system consisting of two work stations, two digitalizing tables, a color printer, and a color plotter connected by a server, operating with ArcInfo GIS software, and used daily by ORMVAT staff
- 6 ORMVAT staff trained through 6 in-country short courses and on the job training in GIS UNIX Systems management, ArcInfo software and GIS applications development.

- Design and entry of farm boundaries, blocs, irrigation canals and farm crop data for the pilot area CDA 536 representing about 5% of the irrigated area of the Tadla perimeter
- Ground water nitrate content, salinity, and elevation monitoring data integrated into GIS, with related periodic maps reproduced by ORMVAT staff
- Chemonics' GIS support unit in Washington contracted with a specialized service to digitalize the whole perimeter, including farm blocks, irrigation and drainage systems and create base maps to speed up the process of integrating applications and system models into GIS

A1b Agro-meteorological automatic weather stations

The project procured, installed and calibrated 3 automatic weather stations (powered by solar panels) during the first quarter of 1996. Data is currently downloaded from an automatic data logger to a laptop computer every two weeks. ORMVAT engineers are using the data to determine crop water requirements and other information useful in planning water deliveries. Six months worth of data on rainfall, temperature, humidity and evapo-transpiration rates have been recorded with accompanying graphs in prototype information bulletins which will serve ORMVAT for improved irrigation system management for the three hydraulic subdivisions of the Tadla perimeter. Installation of a radio telemetric system for the perimeter will transform the three weather stations for real time automated telemetric transfer to ORMVAT central. Specialized training for the operation and maintenance of the agro-met stations awaits the installation of the radio telemetric network to be completed in the first quarter of 1997.

A1c. Flow data canal monitoring stations

The project designed a network of 11 automated flow measurement stations which will transmit real time data of water flows from selected sites in the Beni Amir and Beni Moussa irrigation systems (Replogle, Report # 12). The automated water flow monitoring network will help ORMVAT improve the canal conveyance efficiency by timely controlling the flow that goes into the system and what spills out over the end. ORMVAT with PAGI II funds, completed the construction of physical works for these sites. Chemonics completed the procurement of equipment in 1996. Installation of electronic measurement devices and data recorders will be completed early in 1997.

TABLE 1 1 BASELINE AND PERFORMANCES FOR TRM PROJECT ACTIVITY

**St Objective # 2 Improved Water Resources Management
in the Agricultural, Urban & Industrial sectors**

Indicator # 1	Volume of water savings in target areas																										
Definition/Unit	Volume of water savings in millions of cubic meters																										
Source	TRM reports																										
Baseline & target	<table border="1"> <thead> <tr> <th></th> <th>1994 Baseline</th> <th>1995</th> <th>1996</th> <th>1997</th> <th>1998</th> <th>1999 Target</th> </tr> </thead> <tbody> <tr> <td>Planned</td> <td>0</td> <td>0</td> <td>5</td> <td>10</td> <td>30</td> <td>70</td> </tr> <tr> <td>Actual</td> <td>0</td> <td>2</td> <td>6</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>							1994 Baseline	1995	1996	1997	1998	1999 Target	Planned	0	0	5	10	30	70	Actual	0	2	6			
	1994 Baseline	1995	1996	1997	1998	1999 Target																					
Planned	0	0	5	10	30	70																					
Actual	0	2	6																								
Comments	<p>Water savings will come in particular from improved system level management and improved on-farm water savings in the irrigated perimeters (especially at Tadia)</p> <p>In Tadia, the actual water savings for 1995 & 1996 are derived from the current ORMVAT estimates of canal conveyance efficiency (79% & 82%, respectively) under the assumption that the project related activities contributed 20 % of overall ORMVAT water savings in 1996</p> <p>The project real-time measurements of water flow will be fully operational at the end of 1997. At that time, the project will carry out systematic measures of system inflow and outflow at strategically selected locations of the canal in order to provide ORMVAT with improved means of estimating canal efficiency and improving their total management of the system</p> <p>Figures are for annual water savings, not cumulative</p>																										
Critical assumptions	<ul style="list-style-type: none"> - Continued effort by ORMVAT to reduce canal leakage - Improved system-level management tools adopted by ORMVAT - Contract for land leveling established with the private sector - Line of credit available for the purchase of land leveling equipment - Irrigation Water pricing reviewed 																										

A1d Radio telemetric relay system

A radio telemetric relay system, designed in 1995 for the eleven flow data canal system monitoring points and the three automatic weather stations is essential to provide real time data transmission to the hydraulic subdivisions and to ORMVAT central for improved management of the irrigation system. The move to radio telemetry was due to the lack of reliable telephone service from the remote points of the perimeter. In September of 1996, 15 months after initiating the formal request, the project finally obtained the necessary radio certification and frequency from the Ministry of PTT and proceeded to finalize the procurement of equipment. Completion of the system including the electronic equipment installation and training is scheduled for early 1997.

A1e A computer program for irrigation planning and scheduling

Andy Draper, short-term consultant completed the development of an improved computerized method for irrigation scheduling (Draper, Report # 46). Computer program development took 2.8 person months of effort, beginning in July, 1996, and two trips to complete the work. Draper also provided in his final report an improved description of the irrigation system and a summary of the present water scheduling system as a background to the model. The model is operational and ready for use by the hydraulic subdivisions.

A1f A computer program for automation of water ordering

Nicholas Lombardi, short term consultant, developed a menu driven computer program with dBase IV to automate the MV1, MV2 forms which are used by the hydraulic subdivisions to record and transmit farm level water requests to the subdivision for subsequent allocations to the secondary canals based on those demands (Lombardi, Report #47). These forms are currently filled by hand requiring an enormous amount of personnel time, which could be used more productively in other system management activities. The consultant also developed a means of inserting weekly farm water consumption figures into the databases used for invoice processing. The program is being tested by ORMVAT engineers. Computer program development 3.3 person months and two trips, beginning in July, 1996.

A1g A computer hydraulic simulation model of the canal system U.C. Davis Professor Emeritus, Joe DeVries provided 1.2 person months to initiate the development of a hydraulic simulation model of the canal systems in the Tadla perimeter. When completed, the model will provide ORMVAT engineers the capacity to simulate alternative operating scenarios for increased efficiency in system management and responsiveness. The Irrigation Engineer is supervising the complex data collection process and rationalization of existing engineering blue prints essential to the modeling effort. DeVries will return to complete the model in early 1997.

A1h Extension of Portable Weir Technology Portable broad crested weirs designed by John Repogle for the Project in 1995 are providing a means for ORMVAT to

verify and control water being delivered by the irrigation system to the farm level. The irrigation engineer and the farm management specialist developed an operating manual, which has been used to help train engineers in the use of the weirs. Project trained engineers from the Office of Irrigation Technology have provided assistance in the perimeter-wide training effort. The technology has been extended to ORMVAs of Doukala and Haous at their request, the Project supplying each ORMVAT one complete set of the portable weirs.

A2. Improved on-farm water use efficiency

A2a Laser leveled basin pilot demonstrations

The project has extended this water saving technology from an initial 3 research station plots in 1995 to 20 hectares on 15 farms during 1996. The laser leveled basins have confirmed early estimates of the benefits to be derived from the combined technologies, including uniformity of water distribution, leading to more efficient irrigation, less percolation loss, higher crop yields, and irrigation labor savings. Data collected from the demonstrations show more than 20% of irrigation water is saved by using level basin techniques as compared to the traditional system of "Robta" most commonly used in the area.

As compared to the 20,000 hectares (20 percent of arable irrigated land) considered appropriate for level basin irrigation, the area-wide impact to date is small but not insignificant for this stage of the technology transfer process given the following intermediate results:

- Project trained ORMVAT team do laser leveling, planning of basin design, conducting the level basin demonstrations and monitoring and data collection for followup improvement of system design, training of farmers to manage the level basin technology, conducting field days for extension of the technology.
- Farm level demonstrations, field days and training, have contributed to an increased awareness of the value of the technology. Farmer demand has already outstripped the capacity of the BTI/TRM team to provide the leveling services on a larger than demonstration basis, due to the limited size of the equipment and the number of ORMVAT personnel attached to this effort. The Project rented a tractor from the local John Deere vendor in Casablanca to use with the laser leveling equipment to accelerate the process of land leveling required to help meet the challenge of increased demand. The rented equipment provides the services more cheaply than the originally planned procurement of a tractor.
- Farmers and private entrepreneurs in the Haous region are investigating using the technology in the Haous as well and have the financial means to purchase their own equipment.
- Level basin demonstrations have covered a substantial array of commonly grown and high value crops, including sugar beets, wheat, field corn, sweet corn, white edible beans and a number of alternative tillage and land preparation methods.

- a data base of Tadla level basin performance in collaboration with the U S Water Conservation Laboratory in Phoenix for on-going evaluation results This information will serve to help the process of technology transfer in progress

Strategic indicators for this activity are achievable providing the Project and ORMVAT place more accent for the remaining LOP on

- reinforcement of an extension program focused on level basin technology through involvement of an increased number of farmers using level basins, providing extension information on the subject, increasing number of field days and farmer visits and the training of a core extension cadre for this intensified effort.
- involvement of the private sector in development and supply of laser land leveling services which will include land preparation for level basin irrigation

A2b Other Improved Irrigation Techniques

ORMVAT's program on farm-level water saving technologies includes promotion of micro-irrigation technologies as a priority The World Bank provided impetus for the establishment of micro-irrigation throughout Morocco as part of the PAGI II program The Project, as part of their program to promote water savings technologies used short term assistance to assess existing micro-irrigation technology in the Tadla and the need for its expansion throughout the perimeter (TRM Report # 36) While micro-irrigation is being used in the Tadla by large scale fruit farmers, the study concluded that the Project should stick with the level basin technology as a priority, because of the well established surface irrigation potential, and because of the high cost and advanced management requirements of micro-irrigation equipment and technology, which would not be readily accessible to the average farmer

Farmers on their own have developed flexible pipe irrigation to enhance their use of groundwater pumping which supplements the gravity fed irrigation The Project will use an improved adaptation of flexible pipe irrigation in conjunction with their level basin demonstrations as well as for improved long furrow irrigation to provide an expanded array of relatively low cost alternatives available to farmers

A2c. Second on-farm monitoring and evaluation survey

The Long-term M&E and Farm Management specialists in cooperation with ORMVAT/SEDA staff designed an on-farm survey to monitor progress towards achieving results as measured by the five performance indicators Data analysis of field interviews carried out by 3 ORMVAT staff was completed in December 1996 with the help of a short term consultant The resulting report (Mossedag, Report # 49) is providing a better understanding of farm level fertilizer and pesticide use and practices irrigation technologies, participation in water users groups etc The analysis confirms excess use of nitrogen fertilizers and pesticides and levels of use by major crop The survey provides a useful framework for annually measuring impact on farmer behavior for the remaining life of the project.

B Indicator # 2 Amount of Water Pollution in Target Areas (the Tadla Perimeter)

TRM diagnostic studies have shown that a number of factors influence water quality in the Tadla, both for potable water and for irrigation purposes. These include nitrates, accumulated salts and pesticides. As a part of the re-engineering for measurable results to which the Project is partner in USAID's environment program, the decision was made to focus on actions for the remaining LOP, which would influence nitrates and pesticides entering the ground water. Pesticide issues will be discussed under indicator # 3 below. The Project has identified both point pollution from sugar factories and village sewerage and non-point pollution from increased use of nitrogen fertilizers for intensified agricultural production on irrigated land. Planned attempts in 1996 by the project to address sugar factory effluent problems have not been successful. It is outside the purview of the project to address urban waste issues, even though GIS analyses have tentatively demonstrated a positive correlation between the location of nitrate "hot spots" and that of urban centers and sugar factories in the Tadla. The Project has opted to address the problem of nitrates at the farm level through a program of integrated plant nutrient management (IPNM) initiated in November and discussed below. Due to the newness of the program, Table 1.2 shows no impact in 1996. However, the Project anticipates reducing the estimated 35kg/ha of excess active ingredient nitrogen applied by 25 % through the IPNM program by 1999.

Intermediate results realized in 1996 which contribute to this goal include the following

B1 Develop an improved nitrogen fertilizer management program

The high levels of nitrate in the groundwater of the Tadla perimeter have been attributed in part to heavy and untimely application of nitrogen fertilizer for crop production. In November 1996, two project short term fertilizer consultants, after a detailed investigation of the problem, developed an improved fertilizer program to reduce the amount of nitrate potentially leached into the groundwater (Parish & Moughli, Report # 43). The objective of the program is to develop a series of best management practices that improve farmers returns while reducing the danger of groundwater pollution with nitrates. An integrated demonstration and extension approach to improving farmers practices now has 24 farmers participating. Other elements of the program include redrafting extension leaflets to reflect realistic yield goals and fertilizer recommendations which include type to be used, quantity, placement and timing. Soil testing to determine plant nutrient needs also contributes to rational fertilizer use.

TABLE 1 2 BASELINE AND PERFORMANCES FOR TRM PROJECT ACTIVITY

St Objective # 2 Improved Water Resources Management In the Agriculture sectors

Indicator # 2 Amount of water pollution in target areas																													
Definition/Unit	Reduction in the amount of nitrate potentially leached into the groundwater (excess nitrogen used) in the irrigated perimeters (especially at Tadla) measured in parts per millions (kg of excess unit of nitrogen /ha) for targeted crops																												
Source	TRM reports																												
Comments	<p>The amount of nitrate leached into the ground water is closely linked to the amount of nitrogen respect to crop needs. When nitrogen application exceeds requirements, the potential Nitrogen loss goes rapidly. Therefore, excess of nitrogen applied (beyond the crop needs) is a proxy indicator for the amount of nitrates leached into the groundwater.</p> <p>Reducing the amount of nitrogen excess (beyond crop needs) will eventually result in substantial reduction in the amount of nitrate pollution in ground water. The focus is on wheat and sugar beet because (i) they occupy together more than 50 % of the area in the perimeter (40 % of wheat and 12 % of sugar beet) and (ii) they are among the crops that the farmers are over-fertilizing.</p>																												
Baseline & target	<table border="1"> <thead> <tr> <th></th> <th>1994</th> <th>1995</th> <th>1996 Baseline 35 kg /ha</th> <th>1997</th> <th>1998</th> <th>1999 Target</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td colspan="4" style="text-align: center;">Reduced by</td> </tr> <tr> <td>Planned</td> <td></td> <td></td> <td>0 %</td> <td>10 %</td> <td>15 %</td> <td>25 %</td> </tr> <tr> <td>Actual</td> <td></td> <td></td> <td>0 %</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		1994	1995	1996 Baseline 35 kg /ha	1997	1998	1999 Target				Reduced by				Planned			0 %	10 %	15 %	25 %	Actual			0 %			
	1994	1995	1996 Baseline 35 kg /ha	1997	1998	1999 Target																							
			Reduced by																										
Planned			0 %	10 %	15 %	25 %																							
Actual			0 %																										
Critical assumptions	<ul style="list-style-type: none"> - On-farm water application efficiency improved - Integrated plant nutrient management practices adopted and implemented by ORMVAT extension staff 																												

B2 Water quality monitoring network

ORMVAT Environment Office continues to monitor the water and soil quality from the network established with Project assistance in 1995. With data collected on groundwater nitrate levels the Project GIS center has produced analytical maps of different concentrations of nitrate. The data showed that more than 20 % of the tested wells have high nitrate concentrations. However, high variation in nitrate concentrations were observed from one period to another without any rational explanation. The project recognizes the importance to ORMVAT of continuing this groundwater quality monitoring and will try to help resolve the data quality issues in 1997.

B3 Establish a computerized groundwater model

The TRM project installed MODFLOW, a groundwater model, in ORMVAT in early 1996 with 3.5 person months of technical assistance, and the full time of an ORMVAT to work along side the consultant in the development of the model. This extended effort was required to calibrate the model for steady state conditions. The consultant left the project with the understanding that the ORMVAT engineer would continue the calibration process. In his final report, the consultant proposed an additional 3 months of effort to continue the development of the model to expand its capacity to simulate "transient" conditions, work which he had never done himself. Apparently the ORMVAT "trained" engineer has had difficulty to further calibrate the model for successful operation and needs further technical assistance for that purpose.

C Indicator #3 Farmers Adopting Integrated Pest Management (IPM)

IPM regrettably was not a part of the original TRM project design and contract. It is one of the useful and important results of the reengineering process which took place in late 1995. Because of the lateness in initiating IPM, the Project confined the activity in the Tadla to a limited action, farm-level program which has the most possibility of acceptance by farmers, while maximizing the impact on pesticide reduction during the remaining life of the project. USAID has requested that the TRM include results from the Souss Massa region for reporting purposes, since they consider the Tadla program as linked to and an integral part of the National Program which they support. As illustrated in Table 1.3, performance is measured as the number of farmers practicing integrated pest management for citrus, mora (paprika) and tomatoes, with sugar beets to be added in 1997. Actual results in the Tadla are limited for the first year due to the newness of the program. However, intermediate results described below are indicative of the potential of the program and its sustainability beyond the life of the project.

TABLE 1 3b BASELINE AND PERFORMANCES FOR TRM PROJECT ACTIVITY

Program Outcome No 2 2 Improved Environmental Technologies

Indicator # 3	Number of farmers adopting Integrated Pest Management (IPM) practices																										
Definition/Unit	Measured as number of farmers adopting IPM practices for targeted crops in irrigated perimeter																										
Source	TRM reports																										
Comments	<p>The MRT project will help increase adoption of IPM practices in the irrigated perimeters of Morocco, starting with Tadia & Souss Massa Even though IPM methods could be developed for all crops grown in these perimeters, it was necessary to choose a few crops to focus on considering the time and effort in changing pesticides management practices The citrus and paprika in Tadia and Tomato and citrus in the Souss Massa were chosen for the following reasons</p> <ul style="list-style-type: none"> (a) They are of major economic importance in these perimeters (b) the amount of pesticides used on these crops is high (c) residue levels must be respected for the exportation of these crops (d) several IPM monitoring tools are available for the major pests <p>Other crops could be added when research on certain pests of these crops are well advanced</p>																										
Baseline & target	<table border="1"> <thead> <tr> <th></th> <th>1994 Baseline 0</th> <th>1995</th> <th>1996</th> <th>1997</th> <th>1998</th> <th>1999 Target</th> </tr> </thead> <tbody> <tr> <td>Planned</td> <td></td> <td>10</td> <td>40</td> <td>100</td> <td>300</td> <td>600</td> </tr> <tr> <td>Actual</td> <td></td> <td>8</td> <td>41</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>							1994 Baseline 0	1995	1996	1997	1998	1999 Target	Planned		10	40	100	300	600	Actual		8	41			
	1994 Baseline 0	1995	1996	1997	1998	1999 Target																					
Planned		10	40	100	300	600																					
Actual		8	41																								
Critical assumptions	<ul style="list-style-type: none"> - Adequate coordination between the Ministry of Agriculture Departments in the region (ORMVAs DPA, INRA, IAV Hassan II) in the development IPM practices - Adequate IPM extension program adopted 																										

C1. Pilot Program for Citrus and Paprika.

In June 1996, Dr Helene Chiasson of McGill University and short term IPM consultant, helped initiate a limited IPM program in Tadla (Report No 37), with trials focused on pest management for citrus and paprika. The first is a traditional crop, the other a recent high value crop, for both of which application of massive doses of pesticides have been the norm. Both crops are important exports as well. As part of the program, ORMVAT plant protection coordinator and a technician monitored specialized traps and recorded counts on a weekly basis to provide guidance to the farmers when threshold levels of insect infestation had been reached for limited application of pesticides. The Project M&E specialist supervised data collection and processing. Assessment of results, October, 1996 (Report No 45) confirmed that participating farmers had indeed significantly reduced their application of pesticides on these two crops. Their enthusiasm reinforced the importance of an expanded program, which has been planned for 1997 and beyond. The expanded program will include IPM for sugar beets.

C2 Linkage with the Integrated Plant Protection Program.

In November the Project engaged Dr Abdelhaq Hanafi Professor University IAV-Hassan II, Agadir Branch, to help the project evaluate the results of the first year and assist Dr Chiasson and the TRM team to plan for 1997 and beyond. Dr Hanafi will continue as an active member of the IPM Working Group (See below) to provide periodic assistance for the training of extension agents and farmers, development of extension materials, and with supervision and evaluation of the Tadla IPM program. His participation should help assure the necessary linkages to provide sustainability of the program beyond the life of the project.

C3 Establishing an IPM Core Working Group and Network

In November 1996, a core working group representing ORMVAT, the TRM Project, INRA, the regional Department of Agriculture, Plant Protection Division and the Tadla Young Farmers Association (AJAT) met formally for the first time to establish objectives and a plan of action to develop an IPM network of farmer participants in the Tadla. During two subsequent meetings the group selected participant farmers for and developed the method of operation for a monitoring network consisting of 22 farms with 830 hectares of citrus. The group also selected 15 extension agents who will collaborate with the farmers to do the IPM monitoring and data collection. It is anticipated that an additional 12 to 15 farmers will participate in the program for moro starting in March/April, 1997.

C4 IPM Training .

Integrated pest management related training included providing experience to engineers, extension agents and farmers in installation and use of insect traps and of regular and systematic observation of pest presence, numbers and degree of infestation. The University of California Davis provided two IPM related formal short courses during 1996.

D Indicator #4 Number of farmers in viable Water Users Associations (WUAs)

Over the last three years, ORMVAT has already practiced a program of gradual involvement of WUAs in participation in water resource management. As Table 1.4 indicates, the performance as measured by the number of farmers who are members of an association involved in the management and maintenance of the Tadla perimeter has increased from an initial 204 in one WUA in 1994 to the present 1847 farmer members in six WUAs.

D1 Design for the implementation of WUA in the Tadla irrigation perimeter

In June, 1996, Robert Freitas, organizations and water users association specialist, designed a plan of action for the implementation of Water Users Associations in the Tadla perimeter (Report # 41). The plan provided detailed steps to be taken by ORMVAT to respond to the national trends toward market liberalization and increased WUA involvement in irrigation system operations and maintenance. The consultant recommended a phased approach culminating in the creation of 48 WUA covering all of the Tadla perimeter to be formed in 5 years. A methodology for creating and training the WUA was outlined and responsibilities for both WUA and ORMVAT were proposed. The issue of maintenance responsibilities is dependent on rehabilitation works to be carried out before transfer to the WUA. The consultant underlined the need to address the issue of WUA financing and recommended a high level summit be convened among Ag ministry, USAID, and World Bank officials to address the need to reformulate policies related to financing of WUA.

D2 Invitational Water Policy and Irrigation Management Tour

A group of five delegates, including the ORMVAT director and Ministry of Agriculture officials, toured locations in central and southern California and northern Mexico to address, among other subjects, water user associations. The officials were impressed with the farmer elected management structure and the close cooperation developed between the associations and government agencies in California. The Director of ORMVAT attested to the influence the tour had on his own views of the importance of WUA development. He followed this up with a agency wide campaign to increase WUA involvement in irrigation system management.

D3 ORMVAT Program to Increase Numbers of Farmers in WUAs

ORMVAT has intensified its efforts to develop water user associations during 1996. After establishing a pilot project (CDA 536) water user association with the primary responsibility of managing a quota system of water allocation, a campaign of information and training was initiated to develop five more associations in 1996. The plan should add additional associations each year until complete coverage of the Tadla perimeter.

TABLE 1 4 BASELINE AND PERFORMANCES FOR TRM PROJECT ACTIVITY

Program Outcome No 2 3 Broadened Public Participation for Environmental Action

Indicator # 4	Number of farmers in viable water user Associations																										
Definition/Unit	Measured as number of farmers in viable water users associations participating in the management of the water distribution systems in the Tadla perimeter																										
Source	TRM reports																										
Comments	<p>The GOM is actively working to transfer water management responsibilities from the ORMAVs to local water users associations USAID is promoting this approach at the Tadla perimeter and is working towards replication in the other eight irrigated perimeters</p> <p>The performance indicator reported here is the number of farmers who are members of an association involved in the Tadla system management and maintenance (planning & scheduling)</p> <p>The process of having farmers effectively managing water resources at the local level is a long one and will take several years to complete</p>																										
Baseline & target	<table border="1"> <thead> <tr> <th></th> <th>1994 Baseline 200</th> <th>1995</th> <th>1996</th> <th>1997</th> <th>1998</th> <th>1999 Target</th> </tr> </thead> <tbody> <tr> <td>Planned</td> <td></td> <td>200</td> <td>1000</td> <td>3000</td> <td>6000</td> <td>10000</td> </tr> <tr> <td>Actual</td> <td>200</td> <td>607</td> <td>1847</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>							1994 Baseline 200	1995	1996	1997	1998	1999 Target	Planned		200	1000	3000	6000	10000	Actual	200	607	1847			
	1994 Baseline 200	1995	1996	1997	1998	1999 Target																					
Planned		200	1000	3000	6000	10000																					
Actual	200	607	1847																								
Critical assumptions	<ul style="list-style-type: none"> - Commitment of the GOM to solve financial autonomy issues - Commitment of ORMVAT to strengthen Water Users Associations in Tadla & to adopt project recommendations 																										

E Indicator #5 Dissemination of Technology to Other Irrigated Perimeters

Indicator # 5, Table 1 5 is defined as the number of discrete technologies developed by the TRM activity implemented in other perimeters

As a pilot project, the TRM will disseminate the results obtained from project activities to the other regions in Morocco, thereby fostering improvements in water management and environment protection on a much larger scale. Thus far one technology, the portable broad crested ("Replogle") weir briefly described in Section III A above has been adopted by ORMVAs of Haouz and Doukala. Four other ORMVAs expressed interest in the weirs. As reported earlier these versatile weirs, locally constructed and easy to use provide for improved management of irrigation water to and within the farm for improved water savings. Other intermediate results contributing to this indicator include

E1 National Workshop on Irrigation System Management

TRM Project Monitoring and Evaluation Specialist and the Irrigation Engineer, by invitation contributed to a national workshop and mid-term review of results from PAGI II studies conducted for the 8 other ORMVAs, October 28, 1996. TRM's Monitoring and Evaluation Specialist presented the state of advancement of the project. Following the presentation, Dr. Ait Kadi, Director of AGR, Ministry of Agriculture, commended the TRM Project for the results already in evidence and pointed to them as an example for the other ORMVAs and technical assistance to follow. Other participants also showed enthusiasm for the technologies already being developed in the Tadla by the Project.

E2 U C Davis Technical Short Courses in the Tadla

University of California, Davis instructors provided eight technical short courses in the Tadla to participants from ORMVAT, 6 other ORMVAs, the MAMVA, and farmers from the Tadla region. The array of courses included

- groundwater modeling
- canal modeling
- GIS/ArcInfo applications
- safe use of pesticides
- small scale post harvest technologies (designed for women of rural households)
- IPM theory and practices

The short courses follow a training plan based on a training needs assessment conducted by a training specialist from the University and organized with the Director of ORMVAT and his training staff in the last quarter of 1995. A total of 86 persons participated in the courses, representing 42 person months of training in 1996. Under the U C Davis subcontract with Chemonics, an additional 3 modules will be conducted in 1997. A number of the instructors have provided to ORMVAT valuable on-the-job training as a follow-up to these courses.

Indicator # 5 Dissemination of technology to other irrigated perimeters																											
Definition/Unit	Defined as the number of discrete technologies developed by the TRM activity implemented in other perimeters																										
Source	TRM reports																										
Comments	This indicator will measure the number of discrete technologies developed by the project in the Tadla perimeter and adopted by one or more ORMVAs in other regions of Morocco																										
Baseline & target	<table border="1"> <thead> <tr> <th></th> <th>1994</th> <th>1995 Baseline 0</th> <th>1996</th> <th>1997</th> <th>1998</th> <th>1999 Target</th> </tr> </thead> <tbody> <tr> <td>Planned</td> <td></td> <td></td> <td>1</td> <td>2</td> <td>3</td> <td>5</td> </tr> <tr> <td>Actual</td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>							1994	1995 Baseline 0	1996	1997	1998	1999 Target	Planned			1	2	3	5	Actual			1			
	1994	1995 Baseline 0	1996	1997	1998	1999 Target																					
Planned			1	2	3	5																					
Actual			1																								
Critical assumptions	<ul style="list-style-type: none"> - Commitment of the GOM to nominate participants for training and field days (workshops seminars) in Tadla - Commitment of the GOM to financial support of the new technologies 																										

F Indicator #6 Policy Reform Matrix

The Project contributes to national and regional policy dialogue and reform in the following aspects

- encouraging progressive water pricing policies
- decentralizing water management authorities
- empowering water user associations
- enhancing efficiency of regional irrigation authorities

To track substantive progress in these areas of policy reform, the USAID SO2 activity team has developed the policy reform matrix, Table 1.6 below. A weighted scale provides a basis for an index of progress through the year 2001.

The following 1996 activities have contributed to policy reform:

F1 Dialogue on water pricing policy

While there have been no formal studies directed to the question of water pricing policy in the Tadla, the project has actively joined the dialogue with ORMVAT over the importance of an increase in water pricing. ORMVAT participates at the national level on the Ministry's committee on irrigation water pricing, involving both an in-depth study of appropriate pricing mechanisms and levels and executing a program of progressive water pricing increases, meant to bring demand in line with supply.

F2 Invitational Water Policy and Irrigation Management Tour

As mentioned above, the invitational tour provided the Director of ORMVAT and leaders from the Ministry of Agriculture to interact with National, California State and Local Water District leaders on a variety of policy-related issues including pricing policy options for the empowerment and management of water (irrigation) districts, environmental policy and regulation associated with irrigation and problems associated with the conflicting interests involved in watershed management.

F3 Technical Assistance to Enhance the Efficiency of Irrigation Authorities

As a national policy, the GOM is working to increase the efficiency of irrigation authorities through the reduction in state subsidies, downsizing, and increasing their autonomy. The GOM has selected ORMVAT, because of their past outstanding performance, as the first ORMVA of the nine regional irrigation authorities to reorganize towards a financially autonomous public utility providing services to the perimeter. Increased participation of WUAs in irrigation management is an integral part of the intended reorganization. ORMVAT has used selected elements of Freitas' plan in preparing their proposed reorganizational plan presented in late 1996 to the Ministry of Agriculture and the World Bank. In addition, ORMVAT has requested TRM to provide technical assistance to help with the reengineering process during 1997.

Table 1 6. SO2 Policy Reform Matrix-Results 1995 - 2001

Progress is rated as following

Identification phase	10%
Formulation	10%
Validation	20%
Adoption	30%
Enforcement	30%

Reform	Definition		Year						
			1995	1996	1997	1998	1999	2000	2001
Encourage progressive water pricing policies	Encourage progressive water pricing policies to bring demand into balance with supply. A pricing structure for irrigation water reflecting actual costs is adopted on a progressive basis with increases scheduled on a regular basis over the next several years. Technical assistance to MAMVA/ORMVAT through the TRM project will encourage the implementation of such policies in the Tadla perimeter	Planned		10	20	40	40	70	100
		Actual		10					
Decentralization of water management authorities	Technical assistance will be developed by TRM and WRS project to develop implementing decrees for the devolution of water management authority to Watershed Agencies, as called for the Water Law. In Tadla TRM will provide assistance to MAMVA to help reach agreement with MTP regarding the clear allocation of roles and responsibilities of the Watershed Agency and ORMVAT for those water sector functions that both parties may claim	Planned		10	20	30	40	70	100
		Actual		10					
Water Users Association empowerment	The TRM activity will assist ORMVAT to take steps necessary to support the progressive transfer of responsibilities to the WUAs. This will be accomplished through the provision of technical assistance to 1) assist ORMVAT and WUAs with organizational issues and related training 2) assist in reviewing legislative and administrative issues concerning financial autonomy of the WUAs, and 3) move towards WUA member participation of the ORMVAT Board of Directors	Planned	10	20	30	40	60	70	100
		Actual	10	20					
ORMVAs efficiency enhancement	Enhance the efficiency of irrigation authorities (ORMVAs) through reduction in state subsidies downsizing and increasing their autonomy. TRM project will assist ORMVAT to undertake a re-engineering process that will permit them to effectively respond to the on-going liberalization program of the irrigated agriculture sector in Morocco. This process will help all ORMVAs to become fully autonomous and consequently to be able to generate (through water fees) enough funds to support their personnel and to finance the on-going rehabilitation program of the irrigated perimeters. Through the re-engineering process, ORMVAs will have to increase dependence on WUAs for maintenance and water distribution	Planned			10	20	40	70	100
		Actual							

F4 Inter-sectorial water management study in Morocco

Following a request from the Moroccan Ministry of Agriculture, the project short-term civil engineer and legal expert, Dr R de Jong, reviewed the existing legislation in the water sector of Morocco and the implication of the 1995 Water Law on the MAMVA through its various existing ORMVAs (Report # 42) According to this new Water Law, the Ministry of Public Work (MTP) through its newly created Basin Agency (AB) will undertake a wide range of water management functions on the basis of drainage basins Overlap, interference, and conflict between the existing ORMVAs and the newly created AB might arise in the future The consultant concludes that

- MAMVA should be involved in drafting subsidiary decrees to the Water Law and pursue amendments of the existing ones to rectify the issues he raised
- Jurisdiction and scope of activities of the newly created watershed agency should be clearly defined in collaboration with all the ministries involved in the use of the water

G Other Intermediate Results

G1 Review of Project Indicators and Targets.

In December 1995, at USAID's request, the USAID/ENR and Chemonics TRM project team reviewed TRM project performance indicators and determined modifications needed to make them truly measurable with achievable and realistic targets These targets have provided the focus for this years activities During 1996, this performance indicator review has continued periodically with USAID's Strategic Objective (SO2)Team

G2 USAID Washington TRM Project Review

Assistant Deputy Director for Asia and the Near East, Terrance Brown visited the TRM Project with USAID Director Michael Farbman and Project Officer M'Hamed Hanafi of the Morocco Mission, November 6 and 7, 1996 The Project with ORMVAT organized a full day of field visits to selected sites in the Tadla where project activities are contributing to improved performance of irrigation system management, farm level water savings, WUA development, and the GIS laboratory A dinner with the Director of ORMVAT provided an opportunity for frank exchange on an array of topics related to the Project's contribution to the ORMVAT overall program

G3 Project Mid-Term Evaluation

Cargill Technical Services, (CTS) provided two consultants under subcontract to provide an outside, independent evaluation of the TRM Project at its three year mark The month-long evaluation took place in October and November with a final draft released in mid-January The chief result of the evaluation as determined by USAID will be the extension of the project for one year from the original PACD, September 1998 to September 1999

**SECTION IV
ADMINISTRATIVE INFORMATION**

A Level of Effort

The Level of Effort Chart Table 2A, summarizes total, expended and unused level of effort by major category to date. Table 2B summarizes the LOE by performance indicator. The tables do not include Chemonics Home Office and Local administrative support. The Project fielded 79.5 person months of technical assistance in 1996, including 48 long term expatriate and 31.5 person months of short term technical assistance. This brings the total person months of short term level of effort to 79.9, or 64.4 percent of that anticipated for the LOP.

ORMVAT contributed an estimated 226 person months of LOE in 1996. The ORMVAT contribution illustrates the continued commitment to the Project.

TABLE 2A
PROJECT LEVEL OF EFFORT SUMMARY (Annual report 1996)

1 CONTRACT LEVEL OF EFFORT SUMMARY (PROJECT)																		
	Contractor	Budgeted (contract)					Total	Used		Used					PM Total to date	Remaining		
		Year						Year		Year 3						PM	%	
		1	2	3	4	5		1	2	Qrt 1	Qrt 2	Qrt 3	Qrt 4	Total				
I Long term Expat. Chief of Party Irrig Engineer Farm Mgt Spec M & E Spec Admin Officer	Chemonics	12	12	12	12	6	54	12 0	12 0	3 0	3 0	3 0	3 0	12 0	36 0	18 0	33%	
	Chemonics	12	12	12	12	0	48	12 0	12 0	3 0	3 0	3 0	3 0	12 0	36 0	12 0	25%	
	Chemonics	10	12	12	12	2	48	10 0	12 0	3 0	3 0	3 0	3 0	12 0	34 0	14 0	29%	
	Chemonics	12	12	12	12	0	48	12 0	12 0	3 0	3 0	3 0	3 0	12 0	36 0	12 0	25%	
	Chemonics	12	3	0	0	0	15	12 0	3 0	3 0	3 0	3 0	3 0	12 0	15 0	0 0	0%	
	LT Subtotal		58	51	48	48	8	213	58 0	51 0	12 0	12 0	12 0	12 0	48 0	157 0	56 0	26%
II Short term Expatriate	Chemonics	6	3	2	1	1	13	8 1	1 5		1 8		1 2	3 0	12 6	0 4	3%	
	RMI	11	20	3	4	0	38	12 1	1 8	1 8	4 2	4 5	5 5	16 0	29 9	8 1	21%	
	Agndec	1	5	6	5	0	17	1 0	1 8	0 6	0 6	1 4	3 1	5 7	8 5	8 5	50%	
	NCBA	1	2	3	0	0	6	1 1	0 0		0 5	0 7	0 7	1 9	3 0	3 0	50%	
	Subtotal		19	30	14	10	1	74	22 3	5 1	2 4	7 1	6 6	10 5	26 6	54 0	20 0	27%
	Local	Chemonics	11	4	5	5	1	26	8 6	3 2		1 8		1 4	3 2	15 0	11 0	42%
Agndec		1	9	4	3	0	17	2 6	0 0			0 7	1 0	1 7	4 3	12 7	75%	
SCET		0	7	0	0	0	7	6 6	0 0						6 6	0 4	6%	
Subtotal			12	20	9	8	1	50	17 8	3 2		1 8	0 7	2 4	4 9	25 9	24 1	48%
ST Subtotal		31	50	23	18	2	124	40 1	8 3	2 4	8 9	7 3	12 9	31 5	79 9	44 1	36%	
2 ORMVAT LEVEL OF EFFORT SUMMARY																		
ORMVAT LOE (in P/M)	Scheduled in workplan					Total	Used		Used					PM Total to date				
	Year						Year		Year 3									
	1	2	3	4	5		1	2	Qrt 1	Qrt 2	Qrt 3	Qrt 4	Total					
1 Engineer level	55 3	121 0	209 0				41 0	150 0	50 0	50 5	46 5	43 0	190 0	241 0				
2 Technician level	61 5	67 0	247 0				33 0	70 0	25 0	28 0	29 0	29 0	111 0	128 0				
TOTAL	116 8	188 0	456 0				74 0	220 0	75 0	78 5	75 5	72 0	301 0	595 0				

TABLE 2B

PROJECT LEVEL OF EFFORT (LOE) BY PERFORMANCE INDICATOR (Third annual report 1996)

THIRD ANNUAL WORKPLAN SCHEDULED LOE								USED LOE IN 1996																																		
LOE Type	Performance Indicator*							FIRST QUARTER				SECOND QUARTER				THIRD QUARTER				FOURTH QUARTER				TOTAL																		
	1a	1b	2	3	4	5	TOT	1a	1b	2	3	4	5	TOT	1a	1b	2	3	4	5	TOT	1a	1b	2	3	4	5	TOT	1a	1b	2	3	4	5	TOT							
1-Long term Consultant																																										
Irrigation Eng	56	10	23	06	08	17	120	20	05	02	01	01	01	30	20	05	01	02	01	01	30	20	04	03	01	01	01	30	23	02	02	01	01	01	30	60	14	06	04	03	03	120
Monit & Eval	36	20	22	10	05	27	120	10	06	03	05	01	05	30	09	08	03	03	02	05	30	06	10	10	02	01	01	30	07	10	06	05	01	01	30	25	24	16	10	04	11	120
Farm Manag	08	68	09	11	09	17	120	05	20	02	01	01	01	30	03	20	01	03	02	01	30	03	20	02	01	02	02	30	01	24	02	01	01	01	30	11	60	05	05	05	04	120
Chief of Party	10	05	14	12	15	64	120	06	05	02	02	05	10	30	05	07	01	02	05	10	30	05	07	03	02	08	05	30	05	03	03	05	06	05	30	16	19	06	06	16	25	120
LT Total	110	101	68	38	37	125	480	41	36	09	09	08	17	120	37	40	06	10	10	17	120	34	41	18	06	12	09	120	36	39	13	15	09	08	120	112	117	33	25	30	43	480
2-Short Term Consultant																																										
Chemonics	18						18						00	18	18						18							08			04		12	26		04	30					
RMI	80	20	60	35			195	09	09				18	42	29	13					42	35		08	02			45	08		11		55	68	09	37	26	160				
Agridec		20	40	10	10		80		06				06	06	06						06			14				14	10	21			31	22	35			57				
NCBA					20		20							05	05				05		05				07			07				07			12	07	19					
ST Total	98	40	100	45	30		313	09	15				24	71	18	06	29	13	05	71	35		22		07		66	52	10	21	15		105	62	21	51	13	12	266			
Total TRM LOE(1+2)	208	141	168	84	67	125	793	50	51	09	09	08	17	144	55	46	35	23	15	17	191	69	41	40	06	19	09	186	66	49	34	30	09	08	225	174	136	84	36	42	43	746
ORMVAT staff																																										
Eng level	680	350	280	210	230	140	2090	200	130	10	05	95	60	600	150	120	40	60	95	40	505	130	70	60	30	90	60	465	130	70	60	30	90	60	430	610	390	170	125	370	235	1600
Tech level	800	550	370	320	430	00	2470	100	80	10		30	30	250	40	100	30	60	40	10	280	40	80	60	60	40	10	270	40	80	60	60	40	10	290	220	340	160	180	150	60	1110
Total ORMVAT LOE	1680	900	650	530	660	140	4560	300	210	20	05	125	90	750	190	220	70	120	135	50	785	170	150	120	90	130	60	735	170	150	120	90	130	60	720	830	730	330	305	520	295	3010

Performance Indicator
 1 Increase volume of water savings
 1a Improved canal conveyance efficiency
 1b Improved on farm water use efficiency
 2 Reduction in amount of nitrate leached in the groundwater

3 Increased percentage of Tadia farmers adopting IPM practices
 4 Number of farmers in viable water users associations
 5 Number of discrete technologies developed by TRM activity implemented in other ORMVAs

B Financial Summary

The following tables provide an analysis of expenditures in 1996 compared to the approved work plan budget, an analysis of the current financial position of invoiced expenditures compared to the life of project budget. An estimate of ORMVAT contributions is also included.

Expenditures in 1996 represent 69.02 percent of projected expenditures largely due to lower than anticipated allowances (58.94%), other direct costs (61.11%), subcontracts (58.94%). The training (2.52%) line item represents Chemonics portion for MSc and U.S. Short courses Stipends and Travel which has been tapped for invitational travel and for cost of participation by other ORMVAs and MAMVA in the formal series of short courses offered by the U.C. Davis in Morocco.

Expenditures to date represent 60.04 percent of that budgeted in the contract.

**Fourth Quarter Summary
October 1 to December 31, 1996**

Item	Invoiced October (\$)	Invoiced November (\$)	Invoiced December (\$)	Estimate 4th Quarter (\$)
Salaries	36,072	31,553	33,153	100,778
Fringe Benefits	13,041	10,210	12,094	35,345
Overhead	29,402	24,774	26,115	80,291
Travel & Transport	1,693	1,485	700	3,878
Allowances	2,212	2,162	11,750	16,125
Other Direct Costs	11,114	7,629	11,530	30,273
Equip , Vehicles, Frt	265	12,414	3,279	15,957
Training **	0	1,753	1,673	3,426
Subcontracts	83,638	0	183,617	267,255
Subtotal Costs	177,437	91,980	283,912	553,329
G&A	7,097	3,679	11,356	22,133
Fixed Fee	15,040	7,796	24,064	46,900
Total All Costs	199,574	103,455	319,333	622,362

**Analysis of Expenditures Against Work Plan Budget
January 1 to December 31, 1996**

Item	Invoiced Quarter 1 (\$)	Invoiced Quarter 2 (\$)	Invoiced Quarter 3 (\$)	Invoiced Quarter 4 1996	Total Invoiced 1996	Work Plan Budget 1996	Percent Achieved
Salaries	94 814	92 480	101 448	100 778	389 520	393 020	99 11%
Fringe Benefits	41 961	32 803	34 650	35 345	144 759	154 859	93 48%
Overhead	83 449	74 346	79 424	80 291	317 510	345 793	91 82%
Travel & Transport	2 930	15 237	11 697	3 878	33 742	47 321	71 30%
Allowances	12 191	22 572	15 765	16 125	66 653	109 065	61 11%
Other Direct Costs	28 086	42 475	21 609	30 273	122 443	264 842	46 23%
Equip Vehicles Frt.	18 396	60 088	36 988	15 957	131 430	271 500	48 41%
Training **	0	1 162	(3 728)	3 426	860	34 138	2 52%
Subcontracts	19 095	142 212	88 951	267 255	517 513	877 985	58 94%
Subtotal Costs	300 922	483 375	386 805	553 329	1 724 431	2 498 525	69 02%
G&A	8 486	17 012	15 472	22 133	63 103	70 458	89 56%
Fixed Fee	25 217	40 781	32 786	46 900	145 684	205 519	70 89%
Total All Costs	334 625	541 168	435 063	622 362	1 933 218	2 774 508	69 68%

** Chemonics portion for MSc and U S Short Courses Stipends and Travel

**Analysis of Expenditures Against Contract Life of Project Budget
December 1, 1993 to December 31, 1996**

Item	Invoiced Thru Dec 31 1995 (\$)	Estimate 1996 (\$)	Total Expenditures To Date	Budget LOP (\$)	Remainder LOP (\$)	Percent Remainder (%)
Salaries	836 371	389 520	1 225 891	1 759 310	533 419	30 32%
Fringe Benefits	298 038	144 759	442 797	638 750	195,953	30 68%
Overhead	731,666	317,510	1 049,176	1 541 572	492 396	31 94%
Travel & Transport	119 492	33,742	153 234	362,089	208,855	57 68%
Allowances	200 549	66 653	267 202	505 864	238 662	47 18%
Other Direct Costs	327,106	122 443	449 549	939,165	489 616	52 13%
Equip Vehicles Frt	592 748	131 430	724 178	752 222	28,044	3 73%
Training **	68 010	860	68 870	349 977	281 107	80 32%
Subcontracts	509 632	517 513	1 027 145	2 180 472	1,153,327	52 89%
Subtotal Costs	3 683,612	1,724 431	5 408 043	9,029 421	3 621,378	40 11%
G&A	103,877	63 103	166,981	255,441	88,460	34 63%
Fixed Fee	308,679	145 684	454 363	756,887	302,524	39 97%
Total All Costs	4 096,168	1,933 218	6 029,387	10,041 749	4,012,362	39 96%

** Chemonics portion for MSc and U S Short Courses Stipends and Travel

Summary ORMVAT Contributions (Third annual report, 1996)

Line items	Number	Unit	DH/Un	Total (DH)	Total (US\$)
I-Salaries					
Director	1	PM	27000	27000	3000
Department Head	4	PM	15000	60000	6667
Ingineer Level	204	PM	9660	1970640	218960
Technician level	247	PM	6000	1482000	164667
II- Project office					
Local	12	month	16000	192000	21333
Electincity	12	month	5000	60000	6667
III- Travel expenses					
In Country					
Perdem	180	Day	54	9720	1080
Other expenses (vehicules, gas)				110000	12222
IV Equipment					
Laboratory analysis					
- qualité de l'eau	400	sample	1000	400000	44444
- qualite du sol	40	sample	1500	60000	6667
Tractor for Laser Equipt	1	Tractor	45000	45000	5000
Demonstration Equipt	1		100000	100000	11111
Other equipt				50000	5556
GENERAL TOTAL				4566360	507373

ANNEX A
PERFORMANCE INDICATOR OBJECTIVE TREES

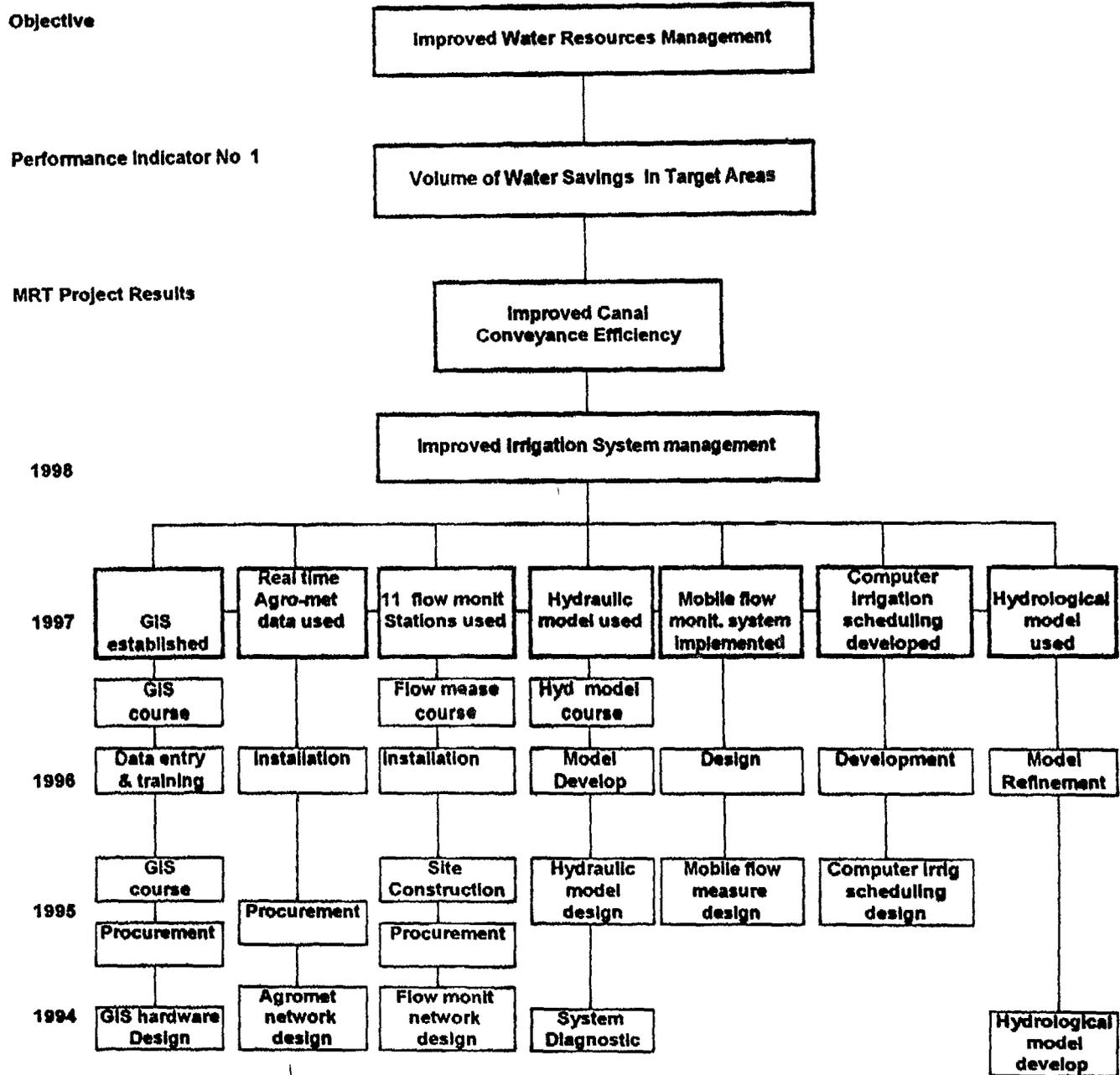


Figure 1a MRT objective tree related to the performance indicator increase water savings

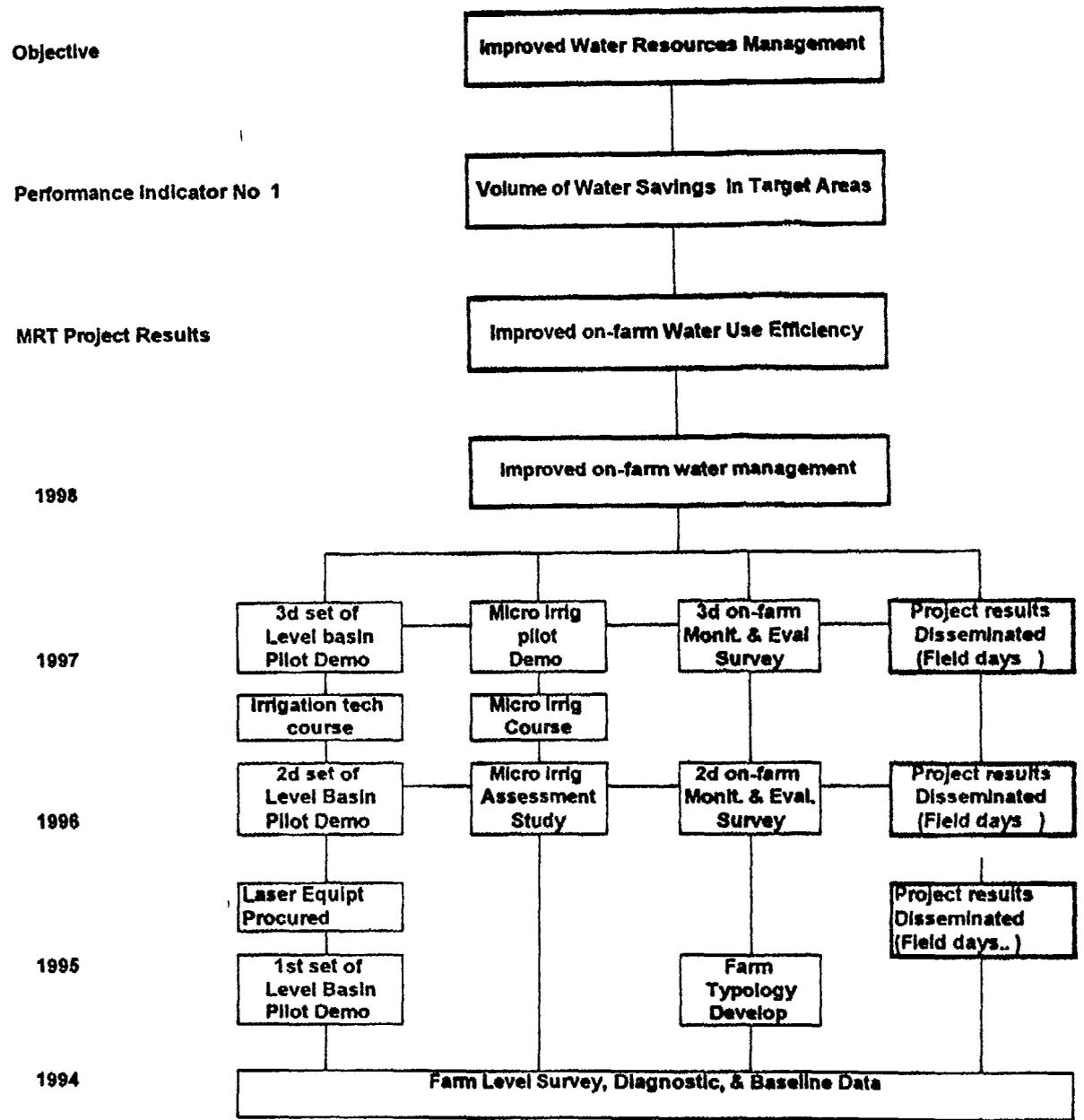


Figure 1b MRT objective tree related to the performance indicator Increase water savings

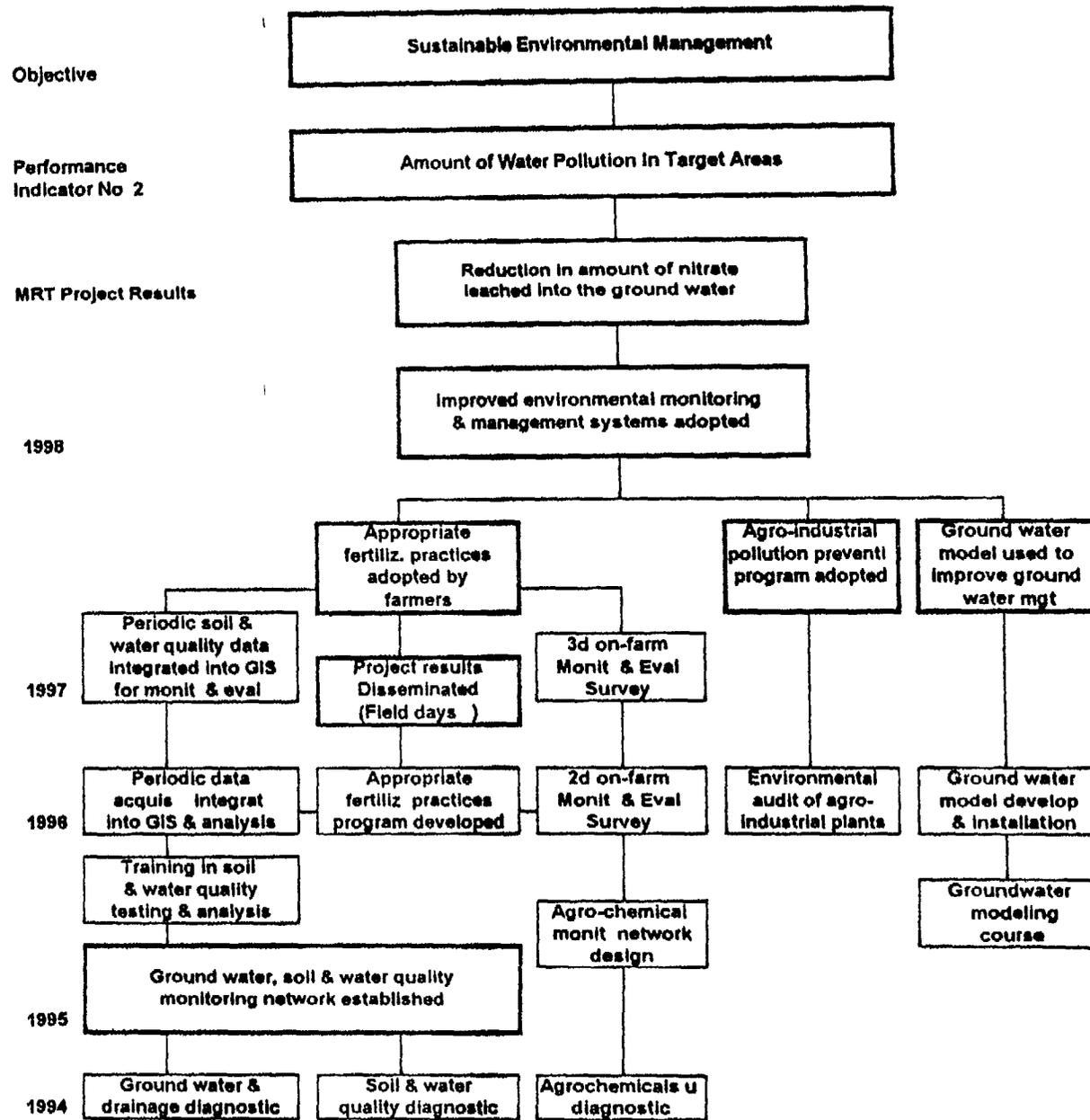


Figure 2 MRT objective tree related to the performance indicator Reduction in amount of nitrate leached in the ground water

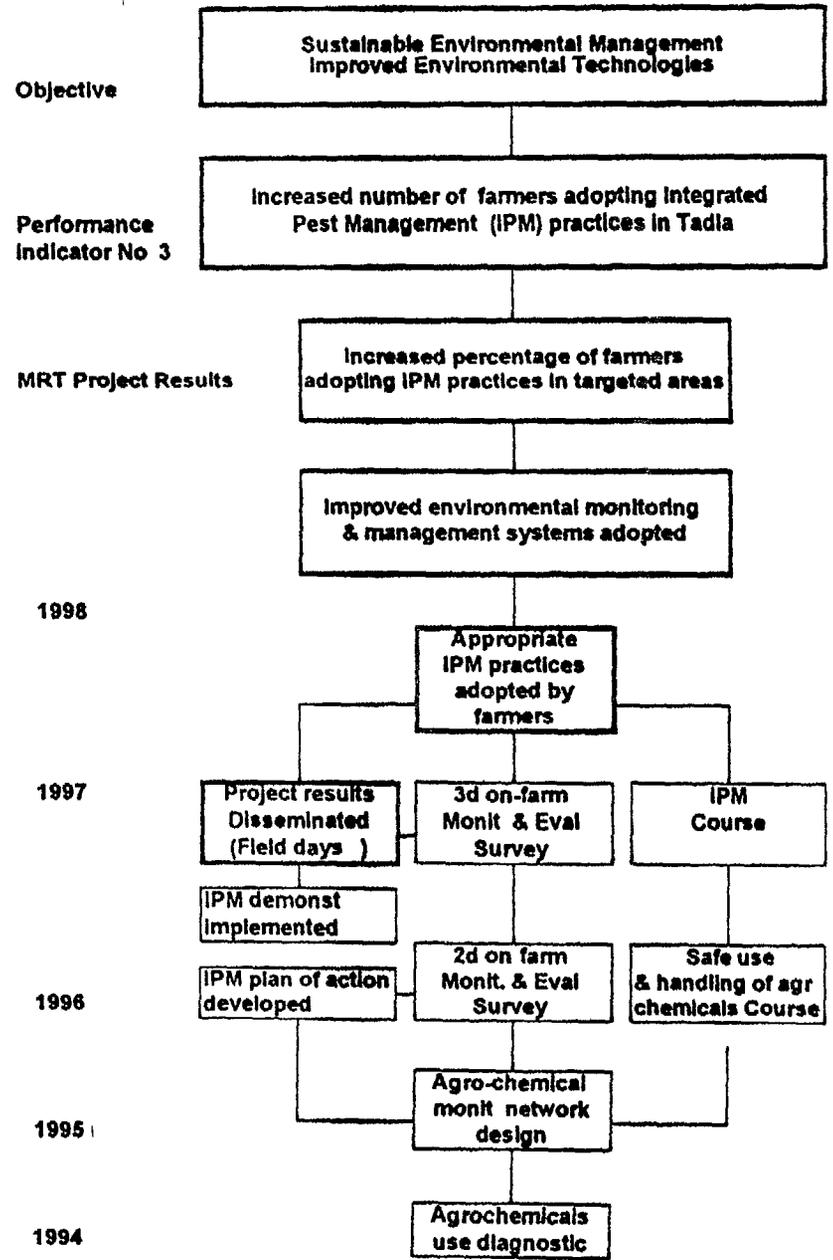


Figure 3 MRT objective tree related to the performance indicator Increased percentage of farmers adopting IPM practices

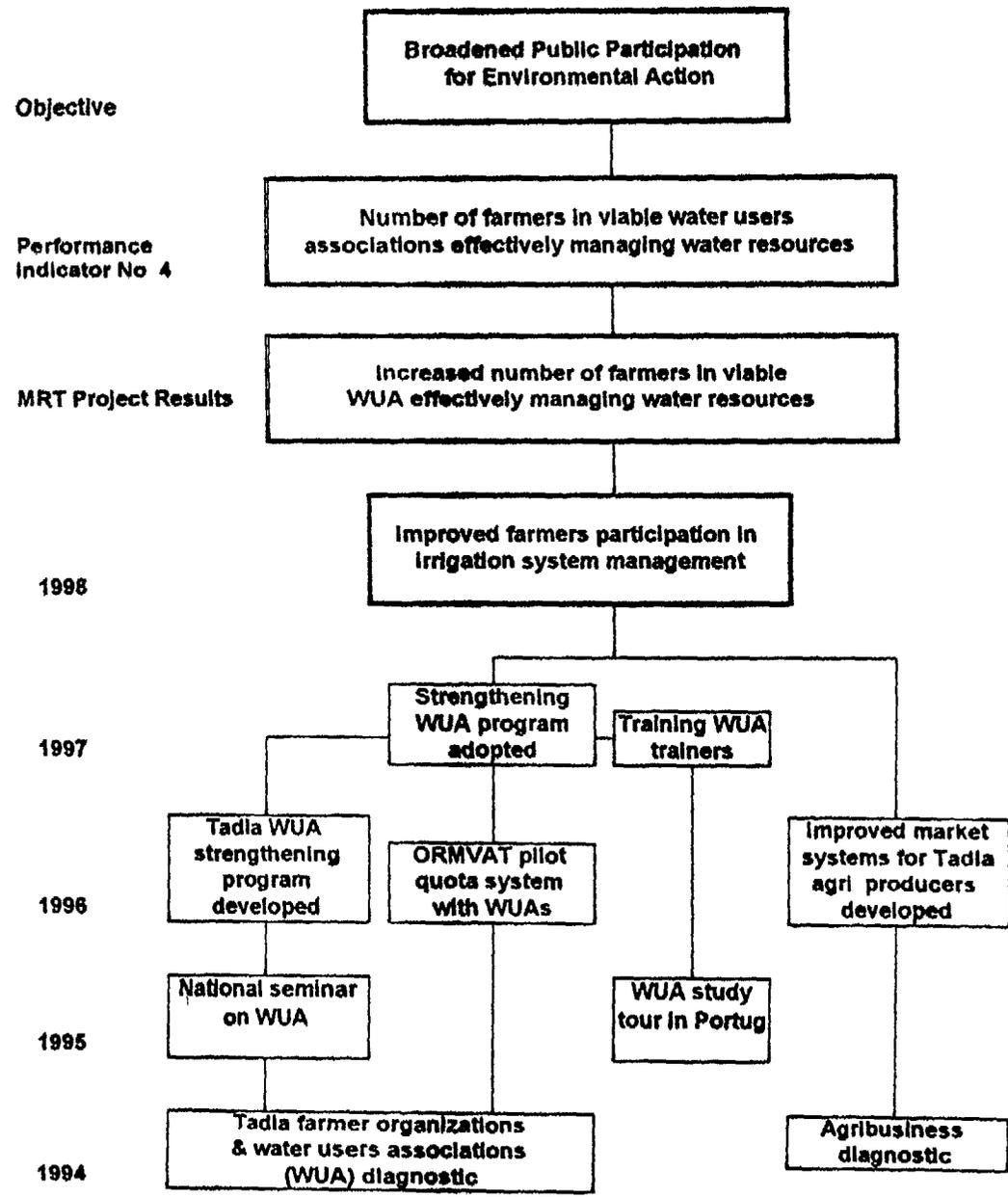


Figure 4 MRT objective tree related to the performance indicator Increased number of farmers in viable Water User's associations

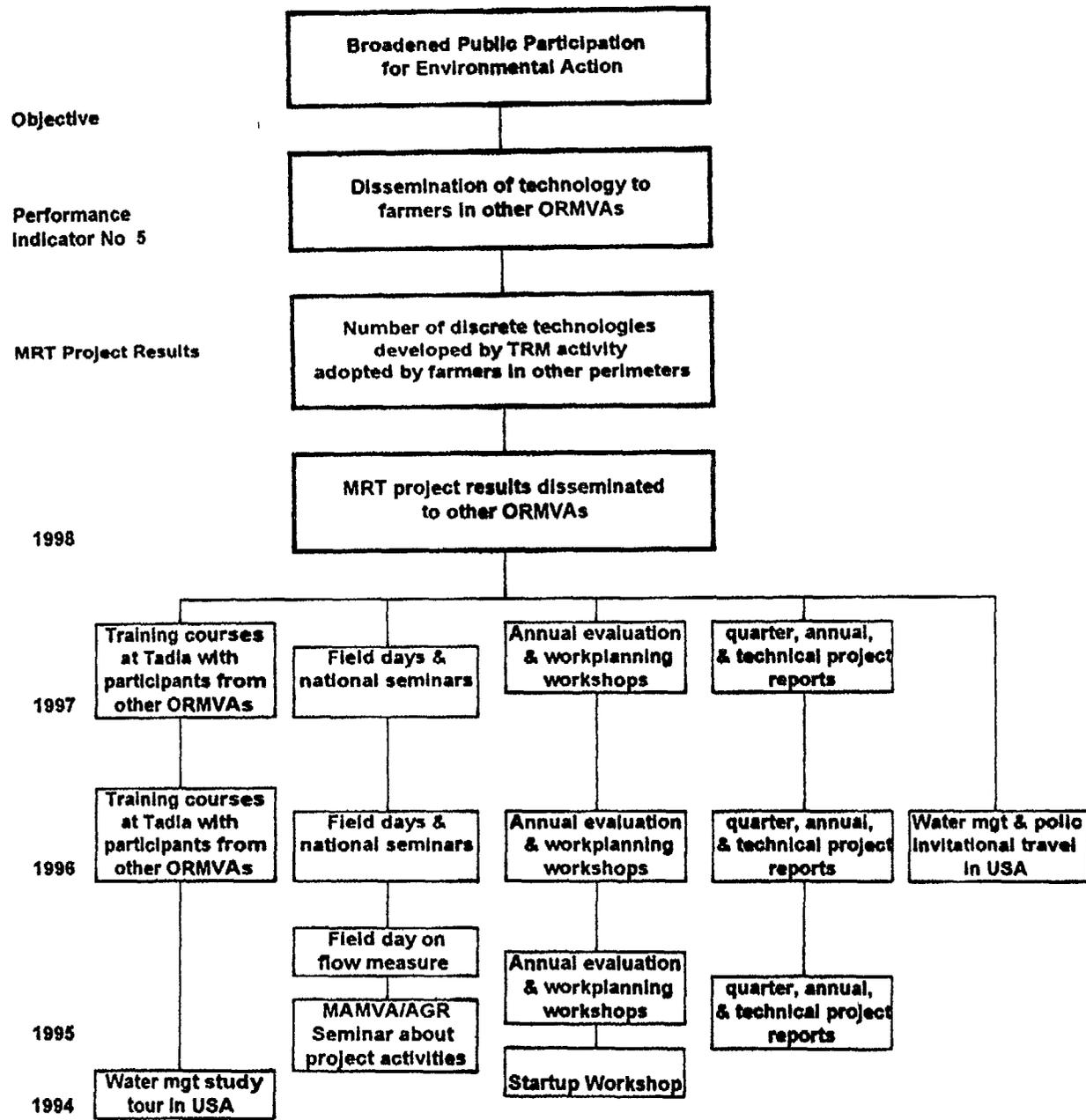


Figure 5 MRT objective tree related to the performance indicator: Number of discrete technologies developed by the project implemented in other ORMVAs

ANNEX B
PROJECT ACTIVITIES ACHIEVEMENT SUMMARY

**Table A11 a Project achievement summary related to the performance indicator No 1
Increase volume of water savings in target areas
Annual report 1996**

Activity	Yr 1	Yr 2	Year 3												% achieved	Yr 4	Yr 5
			Activities in 1996														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
A Improved canal conveyance efficiency																	
1 System Diagnostic Study																	100%
2 Hydrologic Analysis of Water Supply																	100%
Model development																	100%
Use for water supply analysis																	cont.
Model refinement																	100%
3 Establish GIS																	100%
Design GIS hardware & software																	100%
Procurement																	100%
Installation & basic training																	100%
Incorporate data into GIS																	Cont.
Courses in GIS (U C Davis)																	100%
4 Install Agro-meteorological Monitoring Stations																	100%
Design agroclimat. stations																	100%
Procurement																	100%
Installation & training																	80%
Data acquisition & use																	Cont.
5 Establish flow data acquisition system																	100%
Design the system																	100%
Procurement																	100%
Site construction																	100%
Installation & training																	10%
Course in flow measurement (U C Davis)																	100%
Data acquisition & use																	100%
6 Develop Hydraulic Model																	100%
Conceptual design																	100%
Model development																	20%
Installation & training																	100%
Use for system management																	100%
Course in hydraulic modeling (U C Davis)																	100%
Data acquisition & use																	100%
7 Develop mobile flow Monitoring System																	100%
Procurement																	100%
Design & installation																	100%
Use for irrigation system monitoring																	cont.
8 Computer Irrigation Scheduling & planning																	100%
Design & development																	100%
Use for img scheduling & planning																	100%

**Table A1 1a Project achievement summary related to the performance Indicator No 1
Increase volume of water savings in target areas
Annual Report 1996**

Activity	Yr 1	Yr 2	Year 3												% achiev	Yr 4	Yr 5		
			Activities in 1996																
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
B Improved on-farm application efficiency																			
1 Develop Farm Survey & Typology																			
Farm survey & baseline data		*****															100%		
Farm Typology		*****															100%		
2d on-farm monit. & Eval survey (Crop & water application aspects)					*****		*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	100%		
3d on-farm monit. & Eval survey (Crop & water application aspects)																			**
2 On-Farm Pilot Demonst.																			
1st set of level bassin demonst		*****															100%		
Laser equipment procurement		*****															100%		
2d set of level bassin demonst			*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	100%	*	
3d set of level bassin demonst															*****	100%	*****		
Low pressure irngation assessment study					*****											100%			
Training in low pressure irngation technics																		**	
Course in on farm irngation techniques (U C Davis)																		**	
3 Farm Field days & Study Tours																			
Field days	*		**	**	**	**	**	**	**	**	**	**	**	**	**	**	cont	**	**
Study Tours								**									**	**	

**Table A1 2 Project achievement summary related to the performance indicator No 2
Reduction in amount of nitrate leached in the groundwater
Annual Report 1996**

Activity	Yr 1	Yr 2	Year 3												% achiev	Yr 4	Yr 5	
			Activities in 1996															
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
1 Establish ground water, soil & water quality monitoring network																		
Diagnostic Installation & training																100%		
Data acquisition integration into GIS & analysis			Cont			
2 Develop appropriate nitrogen fertilizer application program																		
Develop an action plan & extension program												100%			
Field days & demonstrations														50%			
2d on-farm monit & Eval survey (Agro-chemical aspects)				100%			
3d on farm monit & Eval survey (Agro-chemical aspects)																		
3 Establish Agro-Industrial Pollution Prevention Prog																		
Environmental Audit Program																		
4 Establish Computerized groundwater model																		
Developement & installation						80%			
Use for improved groundwater mgt																		
Course in groundwater modeling (U C Davis)				..											100%			

**Table A1 3 Project achievement summary related to the performance indicator No 3
Percent of farmers adopting integrated pest management practices
Annual report 1996**

Activity	Yr 1	Yr 2	Year 3												% achiev	Yr 4	Yr 5
			Activities in 1996														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
1 Develop an appropriate Integrated Pest Management program																	
Develop an IPM action plan & extension program					*****	*****			*****								100%
Field days & demonstrations									**		**	**					100%
Course in safe use of agro-chemicals (U C Davis)					**												100%
Course in IPM theory & practices (U C Davis)											**						100%
2 Agro-chemical & IPM monitoring & evaluation																	
Agro-chemical use diagnostic		-----															100%
Agro-chemical Monit. Network design		-----															100%
2d on-farm monit. & eval survey (IPM aspects)					*****			*****	*****	*****	*****	*****	*****				100%
3d on-farm monit & Eval survey (IPM aspects)																**	

**Table A1 4 Project achievement summary related to the performance indicator No 4
Number of farmers in viable water users associations
Annual report 1996**

Activity	Yr 1	Yr 2	Year 3												% achievement	Yr 4	Yr 5
			Activities in 1996														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
1 Strengthening Water Users Associations																	
Farmer Organiz & Water Users Associations Diagnostic															100%	
National Seminar on WUAs		*														100%	
Develop Tadia WUA strengthening program															100%	
Training Courses Implementation																**	**
ORMVAT pilot quota system for strengthening WUA					cont	**
2 Tadia agribusiness strengthening																	
Agribusiness Diagnostic															100%	
Develop improved marketing systems for Tadia agn producers																	
Course in small scale postharvest techniques (U C Davis)															**	100%	
Course in extension methods (U C Davis)																	*

**Table A1 5 Project achievement summary related to the performance indicator No 5
 Number of discrete technologies developed by TRM activity implemented in other perimeters
 Annual report 1996**

Activity	Yr 1	Yr 2	Year 3												% achiev	Yr 4	Yr 5	
			Activities in 1996															
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
1 Training course in Tadla with other ORMVA participants (see U C Davis courses table 1a e)																		
Geographic Information Systems (GIS)				**			**					**					100%	
- Hydraulic modeling				**														100%
Groundwater modeling				**														100%
- Safe use of agro-chemicals							**											100%
- On-farm irrigations techniques																		**
Integrated Pest Mgt (IPM)													**					**
- Small scale postharvest												**						**
Extension methods																		**
Flow measurement																		**
2 Information Outreach Workshops & seminars	Cont.
3 Annual evaluation & workplan workshops	Cont.
4 Quarterly, annual, & technical reporting	Cont.
5 Study Tours in USA																		
Water mgt study tour in USA		**																100%
Water mgt & policy Invitational travel							**											100%
6 Intersectorial water management study in Morocco													***					100%

ANNEX C.

LIST OF TECHNICAL ASSISTANCE ACTIVITIES 1996

ANNEX C
LIST OF TECHNICAL ASSISTANCE ACTIVITIES
THIRD ANNUAL REPORT, 1996

Activity	Consultant Name		Sub-contractor	Period	PM	Purpose of Consultation	Achievement
	Expat.	Local					
1st quarter							
Improve on-farm irrigation	W. Wenderly		RMI	Feb 24 Mar 15	0 9	Assessment of micro-irrigation in Tada perimeter	Report # 33 Assessment of micro-irrigation plans in Tada; problems identified, training plan developed
Installation of agro-meteorological monitoring stations	W. Trimmer		RMI	Mar 6	27 0 9	Installation of 3 agro-met. stations in the Tada perimeter	Three agro-met. stations installed
2d quarter							
Hydrological analysis of water supply		M. Teyaa	Chemonics	Apr 8 May 6	1 8	Refinement of the hydrologic model developed in 1995	Establishment of a new graphic module Modification of the software document
Monitoring and evaluation	J. Dorsey		Agridec	Mar 17 Apr 18	1 2	Improving on-farm monitoring & evaluation system	Recommendations for M&E data gathering and management system
Improve ground water management system	A. Shubat		RMI	Apr 18 Jul 17	3 5	Establish a computerized groundwater model	First version of the computer groundwater model installed Report #40
Establishment of an IPM program 1st visit	H. Chasson		RMI	May 4 Jun 6	1 5	Establish an action plan for IPM program in Tada	An action plan for IPM program in Tada developed Report # 37
3d quarter							
Development of Water Users Associations	R. Freitas		NCBA	Jun 16 Jul 19	1 2	Develop a plan for strengthening Water User's Groups in Tada	Establishment of a plan for the development of WUAs Report # 41
Improve irrigation scheduling & planning	A. Draper		RMI	Jun 12 Aug 9	1 2	Develop an improved irrigation scheduling program (1st visit)	Summary of present water scheduling system & proposal for its improvement
	N. Lombardi		RMI	Jul 23 Sep 3	1 7	Develop a computer program for water delivery	First version of a computer program for the automation of water delivery forms
Reduction of the amount of nitrate leached into the groundwater	D. Pansh	H. Moughli	Agridec Agridec	Sep 9 Oct 18	1 5 2	Develop an improved nitrogen application program in order to reduce nitrates contamination of the ground water	in progress
Intersectoral water management study in Morocco	R. de Jong		RMI	Sep 5	18 0 8	Review the existing legislation in the water sector of Morocco and its implication on the ORMVAs	Recommendations to achieve improvements Report # 42
Project workplanning	P. Roark		Chemonics	Sep 27 Oct 15	0 7	Review & preparation for the project mid-term evaluation	Documents for mid-term evaluation
4th quarter							
Improve irrigation scheduling & planning 2d visit	A. Draper		RMI	Sep 24 Oct 20	1 6	Develop an improved irrigation scheduling program (2d visit)	Computer program for improving water scheduling Report # 46
	N. Lombardi		RMI	Oct 1 Nov 11	1 6	Develop a computer program for water delivery (2d visit)	Computer program for improving water ordering & delivery Report # 47
Establishment of an IPM program 2d visit	H. Chasson		RMI	Oct 9	18 0 4	Evaluation of the first IPM demonstrations	First IPM demonstrations evaluated Report # 45
	H. Chasson	A. Hanafi	RMI Chemonics	Nov 21 Dec 8	0 7 0 4	Installation of IPM demonstrations for 1997	Second IPM demonstrations program developed
Canal hydraulic model development 1st visit	J. DeVries		RMI	Oct 8	23 0 6	Develop a canal hydraulic model	Data required for the model identified
	J. DeVries		RMI	Nov 11	26 0 6		
On-farm monitoring & evaluation		F. Mossadeq	Agridec	Nov 25 Dec 25	1	Analyse the data from the second on-farm survey	Results for the second on-farm survey summarized Report #
GIS establishment & training	C. Maxa		Chemonics	Nov 20 Dec 14	0 8	Install the second workstation & train ORMVAT staff in GIS system administration	Second GIS workstation installed & 3 ORMVAT staff trained in GIS system administration

ANNEX D
LIST OF IN-COUNTRY TRAINING COURSES

ANNEX D
List of in Country Training Courses done by UC Davis
Third annual report, 1996

Title	Instructors	Period	Participants
1st quarter			
Ground-Water Modeling-Module II	David Purkey	Jan 29 - Feb 10	3 ORMVAT "Engineers"
Canal Modeling	Joe Devries	Feb 24 - Mar 9	10 ORMVAT "Engineers"
GIS- Arc/Info (1st module)	Marc Vayssieres	Mar 4 - Mar 23	6 ORMVAT "Engineers"
2d quarter			
Safe use of pesticides	Melani Zaval & Mohamed Ammat	May 6 - 17	17 ORMVAs "Engineers" & Technicians
GIS- Arc/Info methods (2d module)	Marc Vayssieres	June 17 - 28	6 ORMVAT "Engineers"
3d quarter			
No courses			
4th quarter			
GIS- Arc/Info methods (3d module)	W Wallender	Oct 7-11	6 ORMVAT "engineers"
Small-scale post harvesting	Lisa Kitanoja Amar Kaanane	Oct 8 - 25	20 ORMVA's engineers & technicians
IPM theory & practices	N Tuscon & H Chiasson	Nov 6-19	18 ORMVA s engineers technicians & farmers

ANNEX E
LIST OF TECHNICAL REPORTS

**ANNEX E. List of MRT Project Technical Reports
(January, 1997)**

- 1 First Annual Workplan, 1994 MRT project, May 1994
- 2 First quarterly report, 1994 MRT project, Apr 1994
- 3 Atelier de demarrage du project MRT Fquih B Saleh du 13 au 16 mai 1994 MRT Project, Jun 1994
- 4 AGIR Analyse de Gestion, Impact et Résultats, A Performance-Based Tracking System Bart Sensing, Jun 1994
- 5 Rapport du voyage d'etude organise aux USA par le project MRT au profil du personnel de l'ORMVAT du 2 au 16 Avnl 1994 ORMVAT, Jun 1994
- 6 Second quarterly report, 1994, MRT project Aug 1994
- 7 Tadla Resource Management Project Diagnostic assessment of Tadla Farmer Organizations (1) Water users Associations, (2) Dairy Cooperatives Ronald Philips, Aug 1994
- 8 Third quarterly report, 1994 MRT project, Oct 1994
- 9 Diagnostic study of the Tadla Irrigation Project Douglas J Oellermann, Oct 1994
- 10 Tadla Resource Management Project Agribusiness Diagnostic Study Tom Easterling, Oct 1994
- 11 Water supply Database Management and A Frequency Analysis Computer programs M'hamed Tayaa, Oct. 1994
- 12 Flow Measurement Instrumentation for the Tadla Irrigation Project John A Replogle, Oct 1994
- 13 Etude Environnementale du perimetre du Tadla Gestion quantitative et qualitative des ressources en eau et sol des périmeteres irrigués de Beni-Moussa et Beni-Amir Abdelhafid Debbagh, Oct 1994
- 14 Environmental Assessment Groundwater and Drainage Roger Stillwater, Nov 1994
- 15 Qualite des sols et des eaux Situation actuelle et methodes de suivi de parametres de qualite Brahim Soudi, Nov 1994
- 16 Selecting Automated Weather station sites and equipment for the Tadla Irrigation Project Walter L Trimmer and Abdellah Ramdani, Nov 1994
- 17 Analyse de la gestion quantitative et qualitative des produits agrochimiques utilises dans le perimetre de Tadla Patrice Dreckmann & Mohamed Ammati, Nov 1994
- 18 Second Annual Workplan, 1994 MRT project, Jan 1995
- 19 First Annual Project Report, 1994 MRT project, Jan 1995
- 20 Essai de Typologie des exploitations du perimetre irrigue du Tadla, Ahmed Herzenni et Fatima Mossadeq, Feb 1995
- 21 Diagnostic des exploitations agricoles du Tadla Resultat de l'enquête SCET-Maroc, Feb 1995
- 22 Improvement of Surface Irrigation Systems in the Tadla Irrigation Project Alan Dedrick, Mar 1995
- 23 1995 First quarterly report, MRT project, Apr 1995
- 24 1995 Second quarterly report, MRT project, Jul 1995
- 25 Mise en place des reseaux de suivi de la nappe phreatique et de la qualite des sols et des eaux du perimetre irrigue de Tadla M Ammati, B Soudi, et A Debbagh, Sep 1995

- 26 Rapport du voyage d'etude effectue au Portugal du 12 au 16 Sept 1995 **ORMVAT**,
Sept 1995
- 27 Improvement of Surface Irrigation Systems in the Tadla Irrigation Project Evaluation
of 1995 level basin bassin demonstration study **Alan Dedrick**, Sep 1995
- 28 1995 Third quarterly report, **MRT project**, Oct 1995
- 29 Third Annual workplan, **MRT project**, Dec 1995
- 30 Formation and implementation of WUA's in the Tadla region **J Schaack** Dec 1995
- 31 Second Annual Report, **MRT project**, Jan 1996
- 32 Geographic Information System (GIS), Needs Assessment, Mapping Requirements,
and Preliminary Applications and Database Design **Keren DeVoto**, Feb 1996
- 33 Reseau agro-chimique du perimetre irrigue du Tadla, suivi & evaluation de l'impact
sur l'environnement **M Ammati**, Dec 1995
- 34 First quarterly report, 1996 **MRT project**, Apr 1996
- 35 Proposal for improving the monitoring and evaluation system of the Tadla Resource
Management Project **Jeff Dorsey**, Apr 1996
- 36 Etat actuel de la micro-irrigation dans le perimetre du Tadla **Wendy Wonderly** Mars
1996
- 37 Etablissement des pratiques de lutte integree dans le perimetre irrigue du Tadla
Helene Chiasson, Jun 1996
- 38 Second quarterly report, 1996 **MRT project**, July 1996
- 39 Manule d'utilisation de l'appareil portatif "Repogle" de mesure de debit dans les
canaux semi-circulaires **TRM/ORMVAT**, Aout 1996
- 40 A ground-water flow model for Tadla plain, Morocco **A. M Shurbaji**, July 1996
- 41 A design for the implementation of Water Users Associations in the Tadla Irrigation
Perimeter **Robert J Freitas**, August 1996
- 42 Intersectorial water Management in Morocco **R.L De Jong** Sep 1996
- 43 Development of an action plan to improve farm level fertilizer utilisation as part of a
strategy to reduce nitrate infiltration into the groundwater **L Moughli & D Parish**,
Oct 1996
- 44 Third quarterly report, 1996, **MRT project**, Sept 1996
- 45 Etablissement des pratiques de lutte integree contre les ravageurs dans le perimetre
irrigue du Tadla Evaluation du programme de lutte integree pour le niora et pour les
agrumes et planification d'un programme pour la betterave sucriere Rapport d'etape
H. Chiasson, Oct. 1996
- 46 Planning & scheduling of water for irrigation in Tadla **A Draper**, Oct 1996
- 47 A Computer application for the automation of water delivery and scheduling **N
Lombardi**, Oct 1996
- 48 Rapport du voyage d'invitation sur la politique et la gestion de l'eau d'irrigation aux
USA **MAMVA**, Juin 1996
- 49 Deuxième enquête des exploitations agricoles dans le perimetre irrigué du Tadla
Evalaution de quelques indicateurs de performance du projet MRT **F Mosseddaq**,
Janv 1997

ANNEX F

LIST OF EQUIPMENT AND MATERIALS PURCHASED IN 1996

Equipment purchased in 1996

DESCRIPTION	AMOUNT	DATE	ORIGIN
Agromet Station	\$ 41071 92	01/26/96	USA
Agromet Station tools	\$ 783 20	02/26/96	USA
3 Pentium computers	\$ 6758 00	02/25/96	USA
Equipment for environment control	\$ 46232 00	04/18/96	USA
13 Radios and accessories	\$ 9550 14	08/11/96	USA
Work-Station "SUN"	\$ 13650 00	09/12/96	USA
5 Radios and accessories	\$ 7331 25	08/11/96	USA